Freshwater Pollution in Some Nigerian Local Communities, Causes, Consequences and Probable Solutions

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Doi:10.5901/ajis.2013.v2n13p111

Abstract

Water is a valued natural resource for the existence of all living organisms. However, this valued resource is increasingly being threatened as human populations grow and demand more water of high quality for domestic purposes and economic activities. Therefore, the management of the quality of this precious resource is of special importance. All water pollution is dangerous to the health of living organism, but fresh water pollution can be especially detrimental to the health of humans and aquatic organisms as it is used as primary sources of portable water by population all over the world particularly in Nigerian communities. This paper examines cases which reflect different causes of freshwater pollution, the seriousness of this pollution, and the consequences on health and proffer probable ways of mitigating the ongoing fresh water pollution problems among Nigerian communities.

Keywords: *Pollution, water, resources, causes, mitigation*

1. Introduction

Water pollution is a major global problem which requires ongoing evaluation and revision of water resource policy at all levels (international down to individual aquifers and wells). It has been suggested that it is the leading worldwide cause of deaths and diseases and that it accounts for the deaths of more than 14,000 people daily (West, 2006; Pink, 2006).

Water is vital to the existence of all living organisms, but this valued resource is increasingly being threatened as human populations grow and demand more water of high quality for domestic purposes and economic activities [UNEPGEMS, 2000]. The significance of water to human and other biological systems cannot be over emphasized, and there are numerous scientific and economic facts that, water shortage or its pollution can cause severe decrease in productivity and deaths of living species (Garba *et al.,* 2008; 2010). Clean and plentiful water provides the foundation for prosperous communities. We rely on clean water to survive, yet right now we are heading towards a water crisis.

Over the last years, in many African countries a considerable population growth has taken place, accompanied by a steep increase in urbanization, industrial and agricultural land use. This has entailed a tremendous increase in discharge of a wide diversity of pollutants to receiving water bodies and has caused undesirable effects on the different components of the aquatic environment and on fisheries [Saad *et al.*, 1984]. As a result, there is growing appreciation that nationally, regionally, and globally, the management and utilization of natural resources need to be improved and that the amount of waste and pollution generated by human activity need to be reduced on a large scale.

The quality of any body of surface or ground water is a function of either or both natural influences and human activities [Stark et al., 2001; Kolawole et al., 2008]. It is now generally accepted that aquatic environments cannot be perceived simply as holding tanks that supply water

for human activities. Rather, these environments are complex matrices that require careful use to ensure sustainable ecosystem functioning well into the future [UNEPGEMS, 2000].

Reports by Food and Agricultural Organization (WHO) of U.S.A revealed that in African countries, particularly Nigeria, water related diseases had been interfering with basic human development (FAO, 2007). An estimated of 580 people in India die of diarrheal sickness every day. Some 90% of China's cities suffer from some degree of water pollution, and nearly 500 million people lack access to safe drinking water (Chinadaily.com.cn. June 7, 2005 assessed today September 25, 2013). In addition to the acute problems of water pollution in developing countries, developed countries continue to struggle with pollution problems as well. In the most recent national report on water quality in the United States, 45 percent of assessed stream miles, 47 percent of assessed lake acres, and 32 percent of assessed bays and estuarine square miles were classified as polluted (EPA, 2002).

According to Galadima *et al.*(2011) the common sources of water that are available to local communities in Nigeria are fast being severed by a number of anthropogenic factors, of which pollution remain the most dominant problem.

Water pollution occurs when unwanted materials with potentials to threaten human and other natural systems find their ways into rivers, lakes, wells, streams, boreholes or even reserved fresh water in homes and industries.

Water pollution is the discharge of waste water_from commercial and industrial waste (intentionally or through spills) into surface waters; discharges of untreated domestic sewage, and chemical contaminants, such as chlorine, from treated sewage; release of waste and contaminants into surface runoff flowing to surface waters (including urban runoff and agricultural runoff, which may contain chemical fertilizers and pesticides); waste disposal and leaching into groundwater; eutrophication and littering.

Rivers are the most important freshwater resource for man. Unfortunately, river waters are being polluted by indiscriminate disposal of sewerage, industrial waste and plethora of human activities, which affects their physico-chemical characteristics and microbiological quality [Kosh and Nayar, 1999]. Increasing numbers and amounts of industrial, agricultural and commercial chemicals discharged into the aquatic environment have led to various deleterious effects on aquatic organisms. Aquatic organisms, including fish, accumulate pollutants directly from contaminated water and indirectly via the food chain [Hammer, 2004; Mohammed, 2009]. The pollutants are usually pathogens, silt and suspended solid particles such as soils, sewage materials, disposed foods, cosmetics, automobile emissions, construction debris and eroded banks from rivers and other waterways (Galadima *et al.*, 2011).

Owing to the large quantity of effluent discharged to the receiving waters, the natural processes of pathogen reduction are inadequate for protection of public health. In addition, industrial wastes that alter the water pH and provide excessive bacterial nutrients often compromise the ability of natural processes to inactivate and destroy pathogens [Gerardi & Zimmarman, 2005]. The extent of discharge of domestic and industrial effluents is such that rivers receiving untreated effluent cannot provide the dilution necessary for their survival as good quality water sources. The transfer of unfavorable releases from industries is detrimental to human and animal health and safety [Adekunle & Eniola, 2008].

Disposal of sewage wastes into a large volume of water could increase the biological oxygen demands to such a high level that all the available oxygen may be removed; consequently, fishes, bottom-dwelling animals and even marine plants can be contaminated and/or killed, creating significant disruption in the food chain. On the other hand, when this contaminated water is directly consumed without proper treatment (a common practice to local communities), spread of diseases such as typhoid, dysentery, cholera, hepatitis etc. will occur (Galadima *et al.,* 2011).

In Nigeria today research indicates that, majority of the common fresh water sources are polluted, resulting to serious outbreak of these and other diseases. A study by Umeh *et al.* (2004) as cited from Galadima *et al.*(2011) work showed that 48% of the people in Katsina-Ala Local

Government area of Benue state are affected by urinary schistosomiasis, due to increase in water pollution index. Some previous investigations indicate that 19% of the whole Nigerian population is affected, with some communities having up to 50% incidence. This has raised serious concerns to World Health Organization, in an attempt to improve cultural and socio-economic standards of people in the tropical region (Okigbo, 1984; Umeh, 1989; Umeh *et al*., 2004).

According to Kolawole *et al*. (2011) prevention of river pollution requires effective monitoring of physico-chemical and microbiological parameters. In most countries, the principal risks to human health associated with the consumption of polluted water are microbiological in nature [WHO, 1997].The bacteriological examination of water has a special significance in pollution studies, as it is a direct measurement of deleterious effect of pollution on human health [APHA, 1981]. Coliforms are the major microbial indicator of monitoring water quality although not an actual cause of disease. Other microorganisms sometimes found in surface waters which have caused human health problems include: *Burkholderia pseudomallei*, *Cryptosporidium parvum*, *Giardia lamblia*, *Salmonella*, *Novovirus* and other viruses, Parasitic worms [Brenner *et al*., 1993; Grant, 1997].

More importantly effluent discharge practices in Nigeria are yet too crude and society is in danger, especially in the industrialized part of the cities. The Federal Environmental Protection Agency (FEPA) established to check these environmental abuses has had little or no impact on pollution control in our cities [Ezeronye & Amogu, 1998]. The aim of this review is to assess the impact of wastewater pollution on aquatic environments and humans in Nigeria.

1.1 Demand for water

According to the report of Galadima *et al*. (2011) recent statistic indicates that 1.2 and 2.4 billion people suffer from lack of safe water supply and secure sanitation respectively. In many developing countries, Nigeria in particular, more than half of the population is affected.

Fresh waters represent the main sources of safe water for household, agricultural and even industrial applications. They are required for drinking, cooking, recreational activities, farming, fishing etc., making them unavoidable for the evolution of society and civilization (Orubu, 2006).

Rivers are the most important freshwater resource available to the local inhabitants which are either unsafe or difficult to obtain and are severely stressed by poor management. These make access to clean water a serious problem, in some instances women and children need to walk for hours to fetch ordinary drinking water (Galadima *et al.*, 2011).

2. Causes of Water Pollution in most Nigerian Communities

2.1 Domestic based water pollution.

One of the most critical problems of developing countries is improper management of vast amount of wastes generated by various anthropogenic activities. More challenging is the unsafe disposal of these wastes into the ambient environment. Water bodies especially freshwater reservoirs are the most affected. This has often rendered these natural resources unsuitable for both primary and/or secondary usage [Fakayode, 2005]. Land disposal of solid waste creates an important source of ground water pollution. The problem of pollution from refuse heaps is greatest where high rainfall and shallow water table occur. Important pollutant frequently found in leachates from refuse dump includes BOD, iron, manganese, chloride and nitrate (Krist, 2000).

2.2 Industrial based water pollution

Wastewaters are generated by many industries as a consequence of their operation and processing. Depending on the industry and their water use, the wastewaters contain suspended solids, both degradable and non-biodegradable organics; oils and greases; heavy metal ions;

dissolved inorganics; acids, bases and coloring compounds [Kosaric, 1992]. In Nigeria, there are many small to large cottage industrial establishments that discharge such harmful wastewater effluents. Although, the physicochemical analysis of the effluents indicates that most of these industries conform to the recommended FEPA [FEPA, 1991] guidelines, however, exceptions occur in the total dissolved solids (TDS) and Nitrate (NO_3^-) contents.

2.3 Agricultural Pollution

According to Galadima *et al.* (2011) agriculture, as the single largest user of freshwater on a global basis and as a major cause of degradation of surface and groundwater resources through erosion and chemical runoff, has cause to be concerned about the global implications of water quality. The associated agro food-processing industry is also a significant source of organic pollution in most countries.

The primary agricultural pollutants are nutrients (particularly nitrogen and phosphorus), sediment, animal wastes, pesticides, and salts. Agricultural sources enter surface water through direct surface runoff or through seepage to ground water that discharges to a surface water outlet. The most common sources of excess nutrients in surface water are chemical fertilizers and manure from animal facilities. Such nutrients cause eutrophication in surface water. Eutrophication is thus depriving the river of oxygen (called oxygen debt). As algae dominates and turn the water green, the growth of other water plants is suppressed; these die first disrupting the food chain.

Pesticides used for pest control in agricultural operations can also contaminate surface as well as ground-water resources. Some of these pesticides contain endocrine disrupting chemicals that can mimic or antagonize the effects of endogenous hormones could potentially have serious effects not only on the development and well-being of an individual organism, but perhaps more importantly on the ability of that organism to reproduce, and its offspring to survive and eventually reproduce(Burkhardt-Holm, 2010). Nitrates also soak into the ground and end up in drinking water. Health problems can occur as a result of this and they contribute to methemeglopbinemia or blue baby syndrome which causes death in infants.

2.4 Oil Spill Based Water Pollution

Oil spillage is a result of leakage of hydrocarbon from the pipes. To a large extent, poor maintenance of oil pipelines and poor monitoring of pressure regimes of the fluids with respect to the strength of the pipe are the main causes. Production of oil and gas is usually accompanied by substantial discharge of wastewater in the form of brines. Based on the report of Galadima *et al*. (2011) constituents of brines include sodium, calcium, ammonia, boron, trace metals, and high total dissolved solids (TDS).

In Nigeria, the local people of the oil rich Niger-Delta, including women and children who are mostly victims of oil spills and other environmental hazards caused by the oil companies, in their own voices, they recount horrifying scenes of killings by agents of the state, destruction of the ecosystem, desecration of sacred sites and the neglect and impoverishment of the people whose lands produce the wealth that sustains the Nigerian nation-state (Krist, 2000).

Several oil spill incidents have occurred in various parts and at different times along Nigerian coasts as cited in the work of Galadima *et a*l (2011). Some major spills in the coastal zone are the GOCON's Escravos spill in 1978 of about 300,000 barrels, SPDC's Forcados Terminal tank failure in 1978 of about 580,000 barrels and Texaco Funiwa-5 blowout in 1980 of about 400,000 barrels. Other oil spill incidents are those of the Abudu pipe line in 1982 of about 18,818 barrels, The Jesse Fire Incident which claimed about a thousand lives and the Idoho Oil Spill of January 1998, of about 40,000 barrels (Peter and Olusegun, 2006). The most publicized of all oil spills in Nigeria occurred on January 17 1980 when a total of 37.0 million litres of crude oil got spilled into the environment. This spill occurred as a result of a blow out at Funiwa 5 offshore station. Nigeria's

largest spill was an offshore well-blow out in January 1980 when an estimated 200,000 barrels of oil (8.4million US gallons) spilled into the Atlantic Ocean from an oil industry facility and that damaged 340 hectares of mangrove (Nwilo and Badejo, 2005).

3. Consequences of Water Pollution

The effect of water pollution can be catastrophic, depending on the kind of chemicals, concentration of the pollutants and where there are polluted. Many water bodies near urban areas (cities and towns) are highly polluted. This is the result of both garbage dumped by individual and dangerous chemicals legally and illegally dumped by manufacturing industries, health centers, schools and market places.

Eventually, humans are affected by this problem as well. People can get disease such as hepatitis by eating seafood's that has been poisoned. In many poor nations of the world, there is always outbreak of cholera and diseases as a result of poor drinking water treatment from contaminated waters

According to CIA (2010) report as cited in Galadima *et al.* (2011) children and new born babies are mostly affected by these severities, as can be seen from the high infant mortality rate in the country. More so, on the other hand, health deteriorations have seriously raised concerns due to persistent human and animal's productivity declination. Water related diseases are the most common causes of illness and death, affecting mainly poor inhabitants in the local communities. Several cases have been reported. In October 2010, 29115 cases involving 1191 deaths of cholera have been reported in just 15 out the 37 states including Federal Capital Territory. The figure increased from 1616 and 126 deaths in 2004. According to Galadima *et al.* (2011) it was observed that the outbreak is still in existence in new areas due to continuous water pollution. Pond water constitutes more than 70% of total water used in Idere community of Oyo state.

Heavy metals poisoning is also a serious health and environmental problem, that in most Nigerian reports, results from absorption in contaminated water or via associated food. Recently Ibeto and Okoye (2010) as cited in the report of Galadima et al. (2011) conducted a study on 240 people, comprising of children, pregnant/nursing women and men in Enugu state. Nickel, manganese and chromium were detected with concentrations exceeding the allowed limits permitted by WHO, in the blood samples of the respondents. The poisoning was generally believed to be occupationaland water-based. In a related development, more than 400 children from seven villages around Gummi and Bukkuyum Local Government areas of Zamfara state, died from Lead poisoning within justsix months in 2010. Medical experts' reports from the state Ministry of Health and Medecins Sans Frontieres (MSF) described the affected children to show devastating symptoms such as;

> *"gastro-intestinal upsets, skin rashes, changes of mood; some were lethargic, some partially paralysed, some had become blind and deaf. The worst affected were coming into the small Ministry of Health clinic with seizures that could last for hour and would sometimes lead to coma and then often to death."*

The poisoning which is primarily associated with mineral exploitation, consumption in water and food and air-based inhalation, have so far affected 3,600 children, with further expectations that 180 villages covering around 30,000 people may be affected. Numerous of these cases are available today in various Nigerian and international publications, the major concern remains how the problems could be fully addressed.

4. Approaches to Pollution Control

It has clearly been established that, pollution of source of domestic water which are surface water is an ongoing problem in most Nigerian communities, especially the government-ignored villages. The tragedy is seriously crippling human development, proper identification of preventive and control measures would be very useful. The above review of the causes, effects or consequences of water pollution on surface waters evidences the need for control of this type of pollution in developing countries, which can best be achieved by proper education and enlightenment of local people on the importance of water sanitation and good waste disposal method, reduction or prevention at the source. Such measures do lead to raw material recovery and reduction in effluent discharges or lower treatment costs. Legal, administrative and technical measures are also necessary to reduce or eliminate the undesirable effects of domestic, agricultural oil spillage and industrial effluents in receiving waters. The establishment of water treatment plants and good regulatory strategies. Adequate budgetary funding is therefore necessary. This can be controlled by standards imposed by the authorities. Levies can be imposed to cover the cost of off-site treatment and disposal.

5. Conclusion

Overuse and pollution of the world's freshwater resources are a recent development. Their long-term consequences are still unknown. Already, however, they have taken a heavy toll on the environment, and they pose increasing risks for many species. Polluted water and lack of sanitation also greatly risk human health. Moreover, the state of freshwater resources contributes to the deterioration of coastal waters and seas. It is therefore critical that more care is taken to reduce pollutants in our fast retreating freshwater supplies.

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